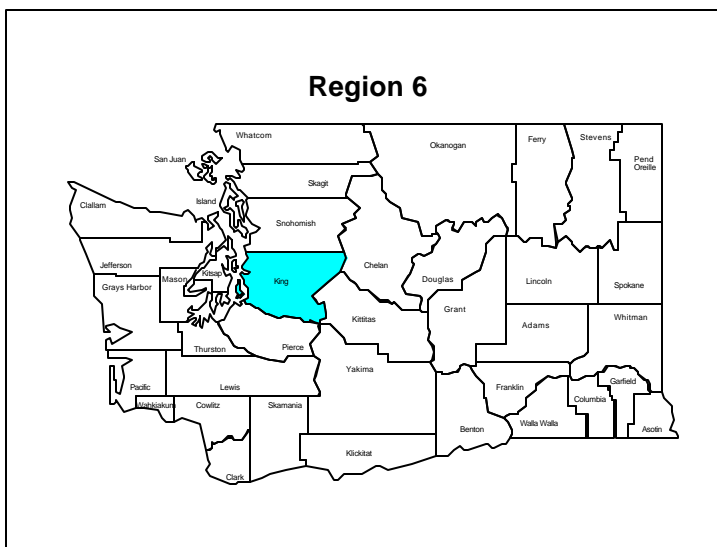


Region 6

King County is the only county in Region 6. It is in the middle of the four counties referred to as the central Puget Sound region (the others being Pierce, Snohomish, and Kitsap).¹

With 2,128 square miles, King County is larger than all but 10 of Washington's 39 counties. Its population in 2000 was 1,737,034, first in the state. The county has 29 percent of the state's population. It also is the most densely populated, with 789 people per square mile.

About 80 percent of King County residents live in cities and towns; 32 percent live in Seattle alone, the largest city in the county, the state, and the Pacific Northwest. The next three largest cities in King County are Bellevue, Federal Way, and Kent. The strong increase during the 1990s of incorporated residents is an indication of expansion of incorporated areas through annexation or incorporation. Among the new cities in the 1990s are Burien, Covington, Kenmore, Maple Valley, New Castle, Sammamish, Shoreline, and Woodinville. King County also is home to the Muckleshoot Indian Tribe, with a reservation near Auburn, and the Snoqualmie Indian Tribe, in east county.



King County has a diverse topography. Beaches, pasture lands, and ski trails are accessible within an hour's drive, with the elevation ranging from sea level to 6,270 feet at Snoqualmie Mountain. The western part of the county, where the vast majority of the population has settled, is an alluvial plain near sea level. In the east are the Cascade Mountains. The county has only three vehicular exits to the east: Stevens Pass, Stampede Pass, and Snoqualmie Pass. A substantial portion of eastern King County is in the Mount Baker-Snoqualmie National Forest.

Except for the northern boundary, shared with Snohomish County, each of King County's boundaries reflects geographic contours. The eastern boundary closely follows the Pacific Crest National Scenic Trail – the crest of the Cascade Range – and separates King from Chelan, Kittitas, and Yakima Counties. Pierce County and the White River make up King County's southern boundary, while the western county faces Puget Sound. Vashon and Maury Islands are part of King County.

Major rivers in King County include the Snoqualmie, White, Green, and Cedar Rivers, all of which flow out of the Cascades through the county. The largest lakes are Lake Washington, which surrounds Mercer Island east of Seattle, and Lake Sammamish, east of Bellevue.

Region 6

King County has evolved from a resource-based economy centered principally in forest products manufacturing, into an increasingly diversified export base with significant orientation in high tech industry, services, and trade serving broad national and worldwide markets. Increasingly greater exports of finished goods and services originating in King County, such as commercial aircraft and computer software, are exported overseas, particularly to Europe and the Far East. The county is home to The Boeing Company, the world's largest producer of commercial airliners, and Microsoft, the world's largest software company. New industry is developing in special market niches with high-growth market potential, such as computer software and biotechnology.

Population and Demographics

Table 1, below, shows King County's population grew less than the state as a whole during the 1990s. The county is a large and mature county that saw its rapid growth occur during an earlier period. Just over a third of its growth was due to people moving into King County; this is lower than the 59 percent experienced by the state as a whole. The county is projected to maintain a growth rate similar to the state through 2025.

Table 1. Population Growth

	1990 Population	2000 Population	% Change	2025 (Projected)	% Change from 2000
King	1,507,305	1,737,034	15.2%	2,318,368	33.5%
<i>Washington State</i>	<i>4,866,663</i>	<i>5,894,121</i>	<i>21.1%</i>	<i>7,975,471</i>	<i>35.3%</i>

Source: U.S. Census Bureau, Census 2000; *2002 Population Trends*, State of Washington Office of Financial Management, Forecasting Division; *Washington State County Population Projections For Growth Management*, Intermediate Projection, State of Washington Office of Financial Management, Forecasting Division, January 2002.

Table 2, below, shows more than 96 percent of King County's population lives in densely settled urbanized areas, a much greater percentage than the state as a whole. The current growth pattern, both urban and rural, affects how agencies prepare for emergencies as changes in the population and development can increase risks associated with hazards.

Table 2. Urban/Rural Populations, 2000

	Urban	Rural
King	1,672,122	64,912
Percentage	96.3%	3.7%
<i>Washington State</i>	<i>81.9%</i>	<i>18.1%</i>

Source: U.S. Census Bureau, Census 2000: Population and Housing by Urban Classification

Region 6

The ability to prepare for and recover from a disaster varies among population groups. Research on various population groups and disasters found that it took some populations longer to recover from a disaster for a variety of reasons. These population groups include minorities, people with language barriers, the disabled, the elderly, and those with low income.

Ethnic Groups

People from non-white population groups generally experience longer recoveries due to lower incomes, savings and insurance; their difficulty accessing insurance; and their using aid and relief organizations differently than was anticipated. Language and cultural differences can pose difficulties in some populations understanding and implementing preparedness and mitigation actions as well as accessing and using available disaster relief.

Table 3, below, shows that King County is more diverse than the state as a whole; its racial and ethnic characteristics shifted during the 1990s. The white population decreased from about 83 percent of the population in 1990 to 77 percent in 2000. The number of Asian and Pacific Islanders grew 45 percent in the 1990s, the fastest among ethnic groups; they make up about 11 percent of the county's population. The number of Hispanics grew by 30 percent, followed by African-Americans, 19 percent increase, and Native Americans, 15 percent increase.

Table 3. Population by Ethnic Group

	Hispanic/ Latino	Asian	African American	Native American	Total
King	5.5%	10.8%	5.4%	0.9%	22.6%
<i>Washington State</i>	<i>7.5%</i>	<i>5.5%</i>	<i>3.2%</i>	<i>1.6%</i>	<i>17.8%</i>

Source: U.S. Census Bureau, Census 2000.

Nearly one in five King County residents do not speak English as their primary language at home, and about 8 percent speak English less than very well, as shown in Table 4, below. This means that a significant segment of the population may have a language barrier that prevents them from preparing for a disaster, responding to an event, or applying for assistance after a disaster. A greater percentage of Asian-Pacific Islanders may have language barriers than other minority people groups.

Region 6

Table 4. Primary Language Spoken at Home

	Language Other Than English	English Less Than Very Well	Spanish	English Less Than Very Well	Other Indo- European	English Less Than Very Well	Asian- Pacific Islander	English Less Than Very Well
King	18.4%	8.0%	4.2%	2.0%	4.6%	1.6%	8.4%	4.4%
Washington State	14.0%	6.4%	5.8%	2.8%	3.2%	1.3%	4.4%	2.2%

Source: U.S. Census Bureau, Profile of Selected Social Characteristics: 2000

Disabled People

People with disabilities often are left out of community preparedness activities for a disaster. They have complex challenges because of hearing, sight, mobility, or mental impairments. Additionally, a significant percentage of working-age people with disabilities do not work. These factors make it difficult for the disabled to prepare in advance of a disaster.

Table 5, below, shows 15 percent of working-age adults in King County have a disability that does not require them to be institutionalized, and only about two in three of them are employed. About two of every five people of retirement age have a disability.

Table 5. Non-Institutionalized Disabled Population

	21 to 64 Years		65 Years and Older
	% of Population	% Employed	% of Population
King	15.1%	62.6%	39.8%
Washington State	17.7%	57.6%	42.3%

Source: U.S. Census Bureau, Profile of Selected Social Characteristics: 2000.

Senior Citizens

Senior citizens may be overlooked in preparedness and recovery activities; their age could lead them to have trouble after a disaster, perhaps not qualify for loans, or become disabled because of the disaster. Table 6, below, shows that one of every 10 people living in King County is older than 65.

Region 6

Table 6. Population Over Age 65

	% of Total Population
King	10.5%
<i>Washington State</i>	<i>11.2%</i>

Source: U.S. Census Bureau, Census 2000.

Poverty

The amount of money people have influences what type of housing they live in, whether they can engage in mitigation actions, and how long it takes to recover. Income is based on a number of factors, including the individual, the economy, availability of jobs, educational opportunity, among others. Expenses can vary by location – rural places are cheaper to live but have fewer jobs, while urban areas can be costly, even for renters.

Table 7, below, shows more than 8 percent of people in King County lives in poverty, slightly less than the state average.

Table 7. Poverty Rates

	% of Total Population	Children Under 18	Over Age 65
King	8.4%	9.4%	7.4%
<i>Washington State</i>	<i>10.6%</i>	<i>13.2%</i>	<i>7.5%</i>

Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000.

School Children

While children overall are captured in figures elsewhere in this profile, the number of children attending school is a concern because many of the school buildings they spend considerable time in each day are older and potentially more vulnerable to the effects of disaster. Table 8, below, shows the population of school-age children in King County; it does not show the number that are in potentially vulnerable buildings.

Table 8. School Enrollment – Kindergarten through High School

	Total	Kindergarten	Elementary	High School
King	287,823	21,552	178,889	87,382
<i>Washington State</i>	<i>1,127,448</i>	<i>82,637</i>	<i>697,192</i>	<i>347,619</i>

Source: U.S. Census Bureau, Profile of Selected Social Characteristics: 2000.

Region 6

Housing

Washington's Growth Management Act encourages local jurisdictions to direct population growth into urban growth areas, where growth and higher densities are expected and supported by urban services. It also requires communities to incorporate mitigation by protecting critical areas and restricting development in areas such as those that are frequently flooded or subject to geologic hazards. Eliminating or limiting development in hazard-prone areas can reduce vulnerability to hazards and the potential loss of life and injuries and property damage.

Table 9, below, provides a breakdown of various housing characteristics in King County.

Table 9. Housing Development

	Single-Family	Multi-Family	Mobile Homes	Other
King	60.2%	37.0%	2.5%	0.2%
<i>Washington State</i>	<i>65.4%</i>	<i>25.6%</i>	<i>8.5%</i>	<i>0.5%</i>

Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000.

The year housing was built is important for mitigation. The older a home is, the greater the risk of damage from natural disasters. Homes built after 1980 are more likely to have been constructed to current standards for hazards such as floods, high winds, snow loads, and earthquake. Table 10, below, shows the periods during which housing was built throughout the region.

The age of King County's housing stock generally mirrors the state average, but is slightly older, with a greater percentage of units built before 1960. One in three housing units has been constructed since 1980.

Table 10. Housing – Year Built

	Pre-1939 – 1959	1960 – 1979	1980 – 2000
King	33.5%	32.5%	33.9%
<i>Washington State</i>	<i>29.4%</i>	<i>32.7%</i>	<i>37.9%</i>

Source: U.S. Census Bureau, Profile of Housing Characteristics 2000.

Household Income

Median household income is an indicator for a region's economic stability. It can be used to compare economic areas as a whole, and it generally shows how income is distributed among the population. Median household income indicates that point where half of all households have a higher income, and half have a lower income.

Region 6

Table 11, below, shows median household income in King County is larger than the state average; in fact, it is the highest in the state.

Table 11. Median Household Income

County	Year 1999
King	\$53,157
<i>Washington State</i>	<i>\$44,776</i>

Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000.

With its huge population and highly paid high-tech and aerospace industries, King County is the strongest driver of the statewide average income. Seattle is the regional industrial and commercial hub, the headquarter offices of a large number of firms are located there, and these workers tend to have higher wages than others do around the state. All of King County's economic sectors have higher salaries than for the state, on average 14 percent higher.

Employment and Industry

The economy of King County is diverse, though more heavily dependent on the services and trade sectors than the state as a whole. It also has a significant influence on the state's economy. Forty-four percent of all jobs in the state are in King County, and the county is the hub of many sectors of the state's economy.

The services sector is the largest in the county's economy, with 31 percent of employment. It has been the fastest growing sector since 1970; 47 percent of all new jobs in King County from 1994 to 1999 (91,100 jobs) were in services.

The largest segment of the services sector is business services; the largest industries within this segment are prepackaged software and help supply services (temporary or contract employment).

Microsoft has led the growth of the county's software industry. It has attracted a number of high-tech industries to the region, along with significant numbers of high-paying jobs. From 1990 to 1999, employment in prepackaged software increased 308 percent; by comparison, total employment increased 22 percent for the same period.

Health care services is the second largest employer in the services sector behind business services.

Some of the highest paid workers in the county are in the services sector, as well as some of the lowest paid workers. However, the bulk of job growth in recent years has been in the higher paid jobs, primarily in the software industry.

Region 6

Trade, with 27 percent of all employment is the second largest sector in the King County economy, and it has the lowest average wage. Eating and drinking establishments employ the largest share of workers.

Fifteen percent of the county's employment base is in manufacturing. Transportation equipment is the largest industry in the sector; the bulk of employment – 79 percent – is in aircraft production. (Note: the Employment Security Department projects employment in aircraft and parts will fall nearly 14 percent statewide from fall 2001 through the fall of 2003. The primary reason is the reduction in aircraft sales by The Boeing Company due to reduced air travel worldwide from the economic slowdown and fallout from the September 11, 2001 terrorist attacks.)

Manufacturing is diversifying, especially in advanced technology, much of which has occurred in recent years in the Technology Corridor of I-5/I-405. After transportation equipment, food and kindred products is the next largest industry, with printing and publishing, and industrial machinery/computer equipment following.

More than 7 percent of King County jobs are in the transportation and public utilities sector. More than half of the state's jobs in this sector are in the county, primarily due to activities at the Port of Seattle and Seattle-Tacoma International Airport. Also, the county is home to the television media that serves most of western Washington.

As a regional financial and insurance hub, King County's employment in the Finance, Insurance and Real Estate sector is proportionally and absolutely larger than the rest of the state. In 1999, the county had 54 percent of all statewide employees in this sector. The state's banking and insurance industries are primarily headquartered in Seattle, as are most security and commodity brokers, holding companies and investment firms.

The share of public employment in King County is less than for the rest of the state (13 percent of jobs in King County vs. 17 percent for the state as a whole). There are about 80,000 employees at the local government level; primary employers are K-12 school districts. State government provides another 41,000 jobs in the county, with employment primarily driven by the University of Washington and 11 community colleges. The federal government, with some 21,291 employees, has a minimal presence in the area, with the one third of its employment in the postal service.

Commuting Patterns^{2, 3, 4}

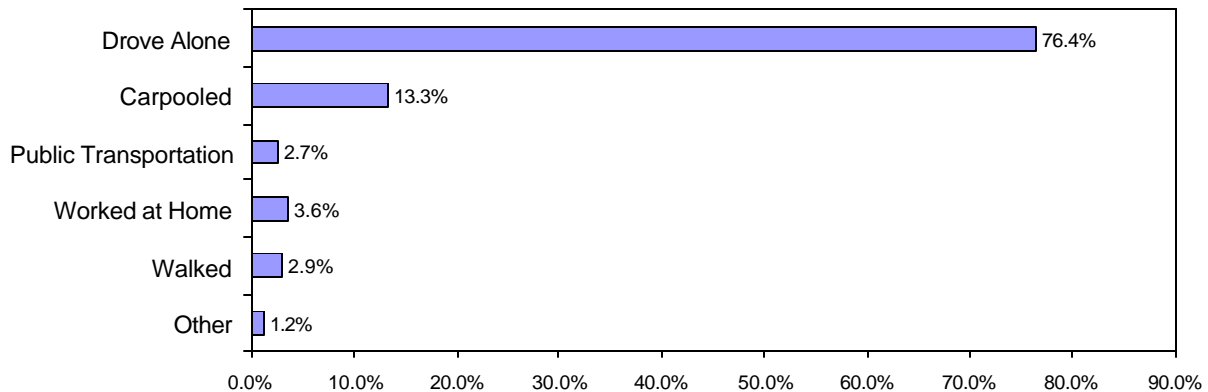
Recent population growth has resulted in a significant increase in workers, automobiles and trucks on the roads. A higher percentage of workers driving alone can cause traffic congestion and accidents. More traffic places a larger load on the region's transportation infrastructure. The impact of an emergency can disrupt automobile traffic, shut down transit systems, and make evacuations more difficult.

A substantial number of people – more than 210,000, according to the 2000 Census – commute into King County for work. The largest number comes from Snohomish County, about 103,000, followed by Pierce County, 80,783, and Kitsap County, 14,960.

Region 6

Figure 1, below, shows transportation used by commuters. Primary mode of transportation is driving alone. Metro Transit, the public bus system in King County carried 97 million riders in 2001. Vanpools carried another 1.9 million passengers in 2001. Sound Transit's Sounder commuter rail line carried 610,218 passengers in 2002 between Tacoma and Seattle; the line has three stops in Pierce County and three in King County. Sound Transit also operates express bus service between Pierce and King Counties; ridership figures for 2001 are not immediately available. The state ferry system carried 12.9 million passengers and 4.6 million vehicles between Seattle and Vashon Island, Bainbridge Island, and Bremerton in 2002.

Figure 1. Commuting Patterns



Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000

Hazards and State Facilities Potentially At-Risk

The regional hazard profiles were developed using information from the individual hazard profiles that are part of the Risk Assessment, as well as from reference documents listed at the end of each hazard profile.

Unless otherwise noted below, at-risk facilities were identified by state agencies participating in this plan using methodology identified in the Risk Assessment Introduction, Tab 7.

Figures for the number of staff/visitors/residents for each at risk facility were calculated on the highest use for that facility; for many structures, this inflates the number of individuals in the buildings at any one time.

The Washington Department of Transportation identified essential transportation corridors, or highways and ferry routes of greatest importance to transportation of people and goods and services.

Region 6

Hazard: Avalanche

Characteristics	Most Vulnerable Areas	Event History	Probability
<p>Avalanches occur when a layer of snow loses its grip on a slope and slides downhill. They occur frequently in the backcountry of the Cascade Range, often without any impact to people, transportation routes or development.</p> <p>Most avalanches that cause injuries or deaths occur outside developed recreation areas; the primary cause of these avalanches is the weight of the victim or someone in the victim's party on the slab of snow. Very few avalanche fatalities occur on open runs in ski areas or on highways.</p> <p>Avalanche season begins in November and runs through early summer for all mountain areas of the state; in high alpine areas of the Cascade Range, the season is year-round.</p>	<ol style="list-style-type: none"> 1. Recreation areas in the Cascade Mountains. 2. Snoqualmie Pass, Interstate 90. 3. Stevens Pass, US Highway 2. 	<p>Avalanches in Region 6 since 1910 that resulted in fatalities occurred in 1910 (96 deaths), 1962 (two deaths), 1974 (two deaths), and 2003 (one death).</p> <p>Additionally, hundreds of travelers were stranded by repeated closures of I-90 due to avalanches in 1996-97.</p>	<p>On average, avalanches kill one to two people every year in Washington State.</p> <p>At least 100 avalanche deaths have occurred in Region 6 since 1910.</p>

Region 6

Hazard: Avalanche		At Risk Population: Unknown of 1,737,034		PRELIMINARY ASSESSMENT	
State Agency Structures At Risk Number and Function of Buildings		No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings	
<u>Total at-risk buildings:</u> Two state highways, no state buildings.		0	0	0	
<u>Function of at-risk buildings:</u> Two state highways are potentially at risk to avalanche:					
1. Interstate 90 through Snoqualmie Pass.					
2. U.S. Highway 2 through Stevens Pass.					
<u>Total at-risk critical facilities:</u> Two state highways, no state buildings.					
<u>Function of at-risk critical facilities:</u> Two state highways considered emphasis corridors because of their importance to movement of people and freight are potentially at risk to avalanche:					
1. Interstate 90 through Snoqualmie Pass.					
2. U.S. Highway 2 through Stevens Pass.					

Region 6

Hazard: Drought

Characteristics	Principal Sources	Event History	Probability
<p>Drought is a prolonged period of dryness severe enough to reduce soil moisture, water and snow levels below the minimum necessary for sustaining plant, animal, and economic systems.</p> <p>Drought can have a widespread impact on the environment and the economy, depending upon its severity, although it typically does not result in loss of life or damage to property, as do other natural disasters.</p> <p>In Region 6, drought conditions can reduce water available for crops and domestic and industrial use, reduce snow pack for skiers, as well as affect the availability and cost of power for local industries.</p>	<p>Drought is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.</p>	<p>During 1895-1995, much of the state was in severe or extreme drought at least 5 percent of the time. Region 6 was in severe or extreme drought from 5 to 10 percent of the time during this period.</p> <p>1977 Drought – This region experienced severe or extreme drought conditions between 10 to 20 percent of the time during this event.</p> <p>2001 Drought – At the height of the event in March 2001, much of this region experienced moderate or severe drought conditions.</p>	<p>In temperate regions of the world, including Washington state, current long-range forecasts of drought have limited reliability. Meteorologists do not believe that reliable forecasts are attainable any more than a season in advance.</p> <p>Drought conditions of at least moderate severity occur every few years in Washington.</p> <p>On a long-term basis, Region 6 experiences drought conditions of at least moderate severity from 5 to 10 percent of the time.</p>

Region 6

Hazard: Drought		At Risk Population: Unknown of 1,737,034		PRELIMINARY ASSESSMENT	
State Agency Structures At Risk Number and Function of Buildings		No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings	
<u>Total at-risk buildings:</u> No state facilities.		0	0	0	
<u>Total at-risk critical facilities:</u> No state facilities.		0	0	0	

Region 6

Hazard: Earthquake

Characteristics	Principal Sources	Event History	Probability
<p>In general, Seismic Hazard Areas in Region 6 are found in:</p> <p>Areas near the Seattle fault.</p> <p>Floodplains and the adjacent bluffs in the Cedar, Green, Sammamish, Snoqualmie, South Fork Skykomish and White River valleys and the Duwamish Waterway because of their high or medium susceptibility to liquefaction and other ground failures.</p> <p>Bluffs along shorelines, including those along the Puget Sound, because of their susceptibility to landslides and other ground failures.</p> <p>Shorelines of Puget Sound and large lakes, because of their susceptibility to tsunamis and seiches.</p>	<ol style="list-style-type: none"> 1. Interplate earthquake in the offshore Cascadia Subduction Zone. Evidence of quakes with magnitude greater than 8 have been found along the Washington coast; the most recent event was about 1700. 2. Shallow, crustal earthquake in the North America (continental) plate. The Seattle fault, which runs from the west side of Puget Sound through Seattle to Issaquah and possibly beyond. Evidence suggests the Seattle fault may be capable of an earthquake of magnitude 7 or greater. 3. Deep, Benioff zone earthquake within the Juan de Fuca plate. This is the source for the 1949, 1965, and 2001 earthquakes. 	<p>AD 900-930 – The Seattle fault generated a magnitude 7 or greater earthquake that caused a tsunami in Puget Sound, landslides in Lake Washington, rockslides on nearby mountains, and a seven-meter uplift of a marine terrace.</p> <p>Since 1970, earthquakes of magnitude 4.0 or greater whose epicenter was in Region 6 occurred in 1970 (M4.1), 1971 (M4.1), 1978 (M4.2), 1994 (M4.3), 1995 (M5.0), and 1996 (M5.4).</p> <p>The region received Presidential Disaster Declarations for the M6.5 Seattle-Tacoma earthquake in 1965 and the M6.8 Nisqually earthquake in 2001.</p> <p>The region experienced significant damage during the M7.1 Olympia earthquake in 1949.</p>	<p>Approximate recurrence rate for a magnitude 9 earthquake in the Cascadia Subduction Zone is once every 350 to 500 years</p> <p>Approximate recurrence rate for the quakes similar to the 1965 magnitude 6.5 Seattle-Tacoma and 2001 magnitude 6.8 Nisqually quake is once every 35 years.</p> <p>Approximate recurrence rate for the 1949 magnitude 7.1 Olympia earthquake is once every 110 years.</p> <p>Approximate recurrence rate of a magnitude 6.5 or greater earthquake on the Seattle fault is once every 1,000 years.</p> <p>Approximate recurrence rate for a magnitude 6.5 or greater earthquake on a shallow, Puget Lowland fault other than the Seattle fault, is once every 333 years.</p>

Region 6

Hazard: Earthquake **At Risk Population:** est. 1,638,175 of 1,737,034 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings
<u>Total at-risk buildings:</u> State Agency identified – 670 (438 owned, 232 leased)	141.509	\$6,790,713,748	\$1,351,262,426

Function of at-risk buildings: Included in the state facilities potentially at-risk to earthquakes are the following:

- Main campus of the University of Washington, off-campus facilities, and its branch campus in Bothell.
- UW Hospital, Harborview Medical Center and Children's Hospital, all on or near the main University of Washington campus.
- Campus of Seattle Central Community College.
- Campus of Fircrest School for individuals with physical and mental disabilities.
- Campus of Echo Glen Children's Center for juvenile offenders.
- Regional headquarters, local detachments, highway weigh scales, and communication facilities of the Washington State Patrol.
- About 170 general office and client service offices that include those serving individuals and families on public assistance, providing employment and training services, driver licensing, and liquor sales.

Six state highways considered emphasis corridors because of their importance to movement of people and freight are potentially at risk to earthquake:

1. Interstate 5
2. Interstate 90
3. Interstate 405
4. U.S. Highway 2
5. State Route 18
6. State Route 167

Additionally, ferry landings in Fauntleroy, Seattle, and Vashon Island are potentially at risk because of their construction on poor soils in shoreline areas.

<u>Total at-risk critical facilities:</u> State Agency identified – 191 (owned-leased split not available)	24,138	\$2,069,180,292	\$476,069,766
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Region 6

Function of at-risk critical facilities: Included in the state facilities potentially at-risk to earthquakes are the following:

- Buildings on the main campus of the University of Washington, off-campus facilities, and its branch campus in Bothell.
- Buildings at UW Hospital, Harborview Medical Center and Children's Hospital, all on or near the main University of Washington campus.
- Buildings on the campus of Fircrest School for individuals with physical and mental disabilities.
- Buildings on the campus of Echo Glen Children's Center for juvenile offenders.
- Regional headquarters, local detachments, highway weigh scales, and communication facilities of the Washington State Patrol.
- General office and client service offices that include those serving individuals and families on public assistance, providing employment and training services, driver licensing, and liquor sales.

Six state highways considered emphasis corridors because of their importance to movement of people and freight are potentially at risk to earthquake:

1. Interstate 5
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3. Interstate 405
4. U.S. Highway 2
5. State Route 18
6. State Route 167

Additionally, ferry landings in Fauntleroy, Seattle, and Vashon Island are potentially at risk because of their construction on poor soils in shoreline areas.

Region 6

Hazard: Flood

Characteristics	Principal Flood Sources	Event History	Probability
<p>Region 6 is subject to two types of flooding – flooding that occurs on the county's major river systems (see right) and flooding that is the result of urbanization, particularly in small stream basins.</p> <p>Because of their origins in upper elevations, these rivers are heavily influenced by snow and rain patterns in the mountains; flooding is most likely to occur from October through June during periods of heavy rainfall and rapid snowmelt. All six rivers travel through broad floodplains with long histories of flooding. Bank erosion is also a threat on several rivers.</p>	<ol style="list-style-type: none"> 1. Cedar River 2. Green River 3. Sammamish River 4. Skykomish River 5. Snoqualmie River 6. White River 	<p>Flooding in Region 6 is a common event. Since 1956, flooding resulted in Presidential Disaster Declarations in 1964, 1972, 1975, 1977, 1979, 1986, 1990 (3 disasters), 1995, 1996, 1997, and 2003.</p> <p>Since 1989, more than \$29.2 million in Stafford Act disaster assistance has been provided to Region 6 for repairs to public facilities following flood events. (Note: Figures do not include October 2003 flood disaster; assistance programs still being administered.)</p>	<p>The region's rivers typically flood every two to five years.</p> <p>Since 1956, this region has experienced serious flooding resulting in major damage and a Presidential Disaster Declaration about every four years.</p> <p>The region has 3.0 percent of its area in the 100-year floodplain.</p>

Region 6

Hazard: Flood

At Risk Population: est. 177,483 of 1,737,034

PRELIMINARY ASSESSMENT

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings
<u>Total at-risk buildings:</u> State Agency identified – 72 (56 owned, 16 leased)	1,468	\$106,331,124	\$73,630,091

Function of at-risk buildings: Included are buildings on the campus of Fircrest School for individuals with physical and mental disabilities, and general office and client service offices that include those serving individuals and families on public assistance, providing employment and training services, driver licensing, and liquor sales.

<u>Total at-risk critical facilities:</u> State Agency identified – 35 (29 owned, six leased)	1.050	\$64,000,000	\$54,212,231
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Function of at-risk critical facilities: Included are buildings on the campus of Fircrest School for individuals with physical and mental disabilities.

Region 6

Hazard: Landslide

Characteristics	Principal Sources	Event History	Probability
<p>Region 6 is part of two landslide provinces.</p> <p>Puget Lowland province – Unconsolidated material overlies the bedrock of much of the Puget Lowland. The lowland bluffs are susceptible to landslides because of their steepness, abundant rainfall and resulting groundwater, and contrasts in permeability of materials. Four landslides affect these bluffs: slumps, debris flows, ancient landslides in unconsolidated materials, and submarine landslides.</p> <p>Cascade Range province – The valley walls north of Snoqualmie Pass have areas of small rock falls, but relatively few landslides otherwise. South of Snoqualmie Pass, peaks are lower and consist of predominantly volcanic rock; earth flows and block slides in bedrock are the most common types of landslides in this area.</p>	<ol style="list-style-type: none"> 1. Bluffs along shorelines of Puget Sound and lakes. 2. Foothills of the Cascade Mountains. 3. Cascade Mountains. 	<p>1891 – Earthquakes and submarine landslides caused water in Lake Washington and Puget Sound to surge onto beaches.</p> <p>1965 – The April 29 Seattle-Tacoma earthquake generated landslides on Mount Si and ground failure on, and in Seattle, Auburn, and Maple Valley.</p> <p>1995-1996 – Seattle recorded more than 40 landslides this winter. Most involved failure of steep coastal cliffs; landslides damaged or threatened homes on a number of streets, and blocked SR 410 east of Enumclaw.</p> <p>Winter 1996-1997 – Most landslides occurred mainly in and north of Seattle along the bluffs of Puget Sound, area lakes and the I-5 corridor; one derailed five cars of a freight train, limiting use of the rail line between Seattle and Everett for weeks.</p> <p>2001 – The Nisqually earthquake caused landslides that blocked the Cedar River, demolished a house near Renton, threatened homes in Burien, and caused ground failures at Boeing Field, Harbor Island, SR 202 near Snoqualmie, and I-405 in Renton.</p>	<p>Ground failures that result in landslides have a number of contributing factors that do not allow for the development of a reasonable estimate probability of future events.</p> <p>Factors that contribute to ground failure and landslides include:</p> <ul style="list-style-type: none"> • Local topography. • Erosion on slopes. • Saturation of slopes. • Earthquakes. • Volcanic deposits and debris flows. • Excess weight on weak slopes. • Human action that disturbs slopes.

Region 6

Hazard: Landslide		At Risk Population: Unknown of 1,737,034		PRELIMINARY ASSESSMENT	
State Agency Structures At Risk Number and Function of Buildings		No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings	
<u>Total at-risk buildings:</u> State Agency identified – 53 (owned-leased split not available)		4,329	\$26,007,529	\$33,689,214	
<u>Function of at-risk buildings:</u> Included are general office and client service offices that include those serving individuals and families on public assistance, providing employment and training services, driver licensing, and liquor sales.					
<u>Total at-risk critical facilities:</u> State Agency identified – 28 (owned-leased split not available)		2,441	\$247,480	\$6,452,402	
<u>Function of at-risk critical facilities:</u> Included are general office and client service offices that include those serving individuals and families on public assistance, providing employment and training services, driver licensing, and liquor sales.					

Region 6

Hazard: Severe Storm

Characteristics	Principal Sources	Event History	Probability
<p>A severe storm is an atmospheric disturbance that results in one or more of the following phenomena: strong winds and large hail, thunderstorms, tornados, rain, snow, or other mixed precipitation. Most storms move into Washington from the Pacific Ocean.</p> <p>Typically, major impacts from a severe storm are to transportation and loss of utilities.</p>	<ol style="list-style-type: none"> 1. High winds 2. Winter storm 3. Tornado 4. Coastal flooding 	<p>Severe storm in Region 6 is a common event. Since 1956, severe storm events resulted in Presidential Disaster Declarations in 1975, 1977, 1979, 1986, 1990 (three disasters), 1993, 1995, 1996.</p> <p>Since 1989, Region 6 received more than \$30.6 million in Stafford Act disaster assistance for repairs to public facilities following severe storm events.</p>	<p>Projected recurrence rates for the severe storm events to which Region 6 is most vulnerable are as follows:</p> <ul style="list-style-type: none"> • High wind events occur once or twice a year. • Tornadoes occur about once every eight years. • Winter storms occur at about twice every three years. • Coastal flooding occurs about once every 10 years in coastal areas.

Region 6

Hazard: Severe Storm

At Risk Population: Unknown of 1,737,034

PRELIMINARY ASSESSMENT

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings
<u>Total at-risk buildings:</u> State Agency identified – 676 (415 owned, 251 leased)	212,001	\$\$6,814,111,729	\$1,275,911,053

Function of at-risk buildings: Included in the state facilities potentially at-risk to severe storm are the following:

- Main campus of the University of Washington, off-campus facilities, and its branch campus in Bothell.
- UW Hospital, Harborview Medical Center and Children's Hospital, all on or near the main University of Washington campus.
- Campus of Seattle Central Community College.
- Campus of Fircrest School for individuals with physical and mental disabilities.
- Campus of Echo Glen Children's Center for juvenile offenders.
- Regional headquarters, local detachments, highway weigh scales, and communication facilities of the Washington State Patrol.
- About 190 general office and client service offices that include those serving individuals and families on public assistance, providing employment and training services, driver licensing, and liquor sales.

Additionally, ferry landings in Fauntleroy, Seattle, and Vashon Island are potentially at risk to severe storms due to their exposure to high winds and surf on exposed shorelines.

<u>Total at-risk critical facilities:</u> State Agency identified – 191 (owned-leased split not available)	24,138	\$2,069,180,292	\$476,069,766
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Function of at-risk critical facilities: Included in the state facilities potentially at-risk to earthquakes are the following:

- Buildings on the main campus of the University of Washington, off-campus facilities, and its branch campus in Bothell.
- Buildings at UW Hospital, Harborview Medical Center and Children's Hospital, all on or near the main University of Washington campus.
- Buildings on the campus of Fircrest School for individuals with physical and mental disabilities.
- Buildings on the campus of Echo Glen Children's Center for juvenile offenders.
- Regional headquarters, local detachments, highway weigh scales, and communication facilities of the Washington State Patrol.
- General office and client service offices that include those serving individuals and families on public assistance, providing employment and training services, driver licensing, and liquor sales.

Additionally, ferry landings in Fauntleroy, Seattle, and Vashon Island are potentially at risk to severe storms due to their exposure to high winds and surf on exposed shorelines.

Region 6

Hazard: Tsunami

Characteristics	Principal Sources	Event History	Probability
<p>A tsunami resembles a series of quickly rising tides that withdraw with currents much like those of a river. Swift currents commonly cause most of the damage. A Pacific Ocean tsunami can affect the entire Pacific basin, while a tsunami in inland waters can affect many miles of shoreline.</p> <p>Tsunamis typically cause the most severe damage and casualties near their source. Waves are highest there because they have not yet lost much energy.</p> <p>Another class of damaging water wave is a seiche. A seiche is a wave generated in a body of water from the passage of seismic waves caused by earthquakes. Sedimentary basins beneath the body of water can amplify a seismic seiche and the natural sloshing action in a body of water or focus water waves onto a section of shoreline.</p>	<p>Tsunamis and seiches can be generated by a number of sources:</p> <ol style="list-style-type: none"> 1. Distant earthquakes along the Pacific Rim (i.e., 1964 Alaska earthquake). 2. Local earthquakes, such as those generated by local surface faults; in the Benioff zone; or in the Cascadia Subduction Zone off the coast. 3. Large landslides into bodies of water, such as Puget Sound or lakes. 4. Submarine landslides in bodies of water such as Puget Sound. 	<p>A.D. 900-930 – A magnitude 7 or greater earthquake on the Seattle fault created uplift on the floor of Puget Sound. The uplift generated a tsunami that deposited a sand sheet at West Point and the Duwamish Delta in Seattle. Computer simulations showed the tsunami reached heights of 10 feet or more on the Seattle waterfront.</p> <p>1891 – Water in Lake Washington and Puget Sound surged onto beaches two feet above the high water mark from two earthquake shocks and submarine landslides.</p> <p>1964 – The tsunami generated by the M9.2 Alaska earthquake raised the water level 0.1 feet in Elliott Bay, Seattle.</p> <p>Seiches damaged 20 houseboats, buckled moorings, broke water and sewer lines in Lake Union following earthquakes in 1964 (Alaska, M9.2), and 2002 (Denali, Alaska, M7.9). Sloshing action was observed in area lakes following these distant earthquakes as well as local events in 1949 (M7.1) and 1965 (M6.5).</p>	<p>Estimated recurrence rate of an earthquake on the Seattle fault of the size necessary to generate a tsunami or seiche is estimated at once every 1,100 years.</p> <p>Great earthquakes in the North Pacific or along the Pacific coast of South America that generate tsunamis that sweep through the entire Pacific basin occur at a rate of about six every 100 years.</p>

Region 6

Hazard: Tsunami		At Risk Population: Unknown of 1,737,034		PRELIMINARY ASSESSMENT	
State Agency Structures At Risk Number and Function of Buildings		No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings	
<u>Total at-risk buildings:</u> State Agency identified – 20 (12 owned, 8 leased)		1,400	\$79,238,317	\$57,494,167	
<u>Function of at-risk buildings:</u> Included in the state facilities potentially at risk to the direct and indirect impacts of tsunami are general office and client service offices and laboratory buildings on the University of Washington campus.					
<u>Total at-risk critical facilities:</u> State Agency identified – 13 (5 owned, 8 leased split not available)		1,072	\$70,018,100	\$10,710,708	
<u>Function of at-risk critical facilities:</u> Included in the state facilities potentially at risk to the direct and indirect impacts of tsunami are general office and client service offices and laboratory buildings on the University of Washington campus.					

Region 6

Hazard: Volcano

Characteristics	Volcanoes in Region	Event History	Probability
<p>Region 6 does not have a volcano, but it has been impacted by the one considered most dangerous in the state – Mount Rainier.</p> <p>Volcanoes can lie dormant for centuries between eruptions; the risk posed by volcanic activity is not always apparent. When Cascades volcanoes do erupt, high-speed avalanches of hot ash and rock called pyroclastic flows, lava flows, and landslides can devastate areas 10 or more miles away, while huge mudflows of volcanic ash and debris called lahars can inundate valleys more than 50 miles downstream. Falling ash from explosive eruptions can disrupt human activities hundreds of miles downwind, and drifting clouds of fine ash can cause severe damage to the engines of jet aircraft hundreds or thousands of miles away.</p> <p>Mount Rainier is considered most dangerous because more than 150,000 people live on deposits from previous lahars generated by the mountain. It also is capped by more glacier ice than the rest of the Cascade volcanoes combined.</p>	<p>1. Mount Rainier</p>	<p>During the past 10,000 years, Mount Rainier has generated at least 60 lahars. Region 6 has been affected by three classes of lahars, Case M, Case I, and Case II lahars.</p> <p>Case M – This is the largest of Mount Rainier's lahars. The largest Case M is the Osceola Mudflow, 10 times larger than any other known lahar from the volcano. It occurred 6,000 years ago. Deposits extend at least as far as Kent, and possibly to the mouth of the Duwamish Waterway in Seattle. Enumclaw and Auburn are at least partly located on Osceola deposits.</p> <p>Case I – Many of these flows, much smaller than the Osceola, have reached the Puget Lowland. Today, a Case I lahar could damage or destroy parts of Auburn.</p> <p>Case II – More than a dozen have occurred in the past 6,000 years. One filled the White River valley and flowed 60 miles to Auburn.</p>	<p>Lahars pose the most serious threat of all volcanic hazards in Region 6.</p> <p>Lahars that reach the Puget Lowland occur every 500 to 1,000 years, with smaller flows not traveling as far occurring more frequently. Scientists believe there is a one in seven chance a lahar will reach the Puget Lowland in the average human lifespan if future lahars occur at rates similar to those of previous lahars.</p> <p>Recurrence rate for lahars flowing off Mount Rainier are as follows:</p> <ul style="list-style-type: none"> • Case M – These lahars occur far less than once every 1,000 years. • Case I – These lahars occur about once every 500 to 1,000 years. • Case II – These lahars occur about once every 100 years. <p>Ash fall is not nearly as significant a threat as lahars. Due to prevailing westerly winds, the possibility of an annual ash fall of one centimeter in Region 6 from any major Cascade volcano ranges from 1 in 100 to 1 in 5,000, depending on location.</p>

Region 6

Hazard: Volcano

At Risk Population: est. 126,545 of 1,737,034

PRELIMINARY ASSESSMENT

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings
<u>Total at-risk buildings:</u> State Agency identified – 57 (48 owned, 9 leased)	1,686	\$32,709,522	\$36,198,934

Function of at-risk buildings: Included in the state facilities potentially at risk to lahar or ash fall from a volcanic eruption are the campus of Echo Glen Children's Center for juvenile offenders and about 14 general office and client services offices.

Two state highways are potentially at risk to volcanic eruptions that produce lahars in river valleys through which the highways traverse or they cross:

1. State Route 167
2. State Route 410

<u>Total at-risk critical facilities:</u> State Agency identified – 23 (owned-leased split not available)	733	\$17,000,000	\$15,533,939
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Function of at-risk critical facilities: Included in the state facilities potentially at risk to lahar or ash fall from a volcanic eruption are the buildings on the campus of Echo Glen Children's Center for juvenile offenders and general office and client services offices.

One state highways is potentially at risk to volcanic eruptions that produce lahars in river valleys through which the highway traverses or crosses:

1. State Route 167

Region 6

Hazard: Wildland Fire

Characteristics	Principal Sources	Event History	Probability
<p>Wildland fires are fires caused by nature or humans that result in the uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property in non-urban areas.</p> <p>A fire needs three elements in the right combination to start and grow – a heat source, fuel, and oxygen. How a fire behaves primarily depends on the characteristics of available fuel, weather conditions, and terrain.</p> <p>The wildland fire season in Washington usually begins in early July and typically culminates in late September with a moisture event. Drought, snow pack, and local weather conditions can expand the length of the fire season.</p>	<ol style="list-style-type: none"> 1. Humans – people start most wildland fires; from 1992 to 2001, people, on average, caused more than 500 wildland fires each year on state-protected lands. Human-caused fires burn an average of 4,404 state-protected acres each year. 2. Lightning – lightning on average started 135 wildland fires annually on state-protected land during 1992-2001. Lightning-caused fires burn more state-protected acreage than any other cause, an average of 10,866 acres annually. 	<p>None of the state's most significant wildland fires occurred in Region 6, although smaller wildland fires have occurred in the region.</p> <p>All but the Snoqualmie Pass area of Region 6 is part of the South Puget Sound fire protection region of the Washington Department of Natural Resources (this fire protection region also includes portions of Region 3 and Region 6). During 1992-2001, the South Puget Sound region averaged 182 fires a year that burned an average of 81 acres of state-protected lands (specific fire data for Region 6 is not available).</p>	<p>Nearly all of the state's significant wildland fires have occurred in Eastern Washington.</p> <p>Western Washington is less prone to catastrophic wildland fires than Eastern Washington – the east has both lighter fuels that burn more easily and more snags and hazard trees, and weather conditions more favorable to fire (thunderstorms with dry lightning are more prevalent in the east).</p> <p>Also, the west has a shorter fire season than the eastern half of the state – the west receives more rainfall, has wetter and cooler spring seasons, and is more urbanized.</p>

Region 6

Hazard: Wildland Fire		At Risk Population: est. 18,464 of 1,737,034		PRELIMINARY ASSESSMENT	
State Agency Structures At Risk Number and Function of Buildings		No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Buildings	
<u>Total at-risk buildings:</u> State Agency identified – 65 (53 owned, 12 leased)		1,611	\$39,770,275	\$30,082,205	
<u>Function of at-risk buildings:</u> Included in the state facilities potentially at risk to wildland fire are the campus of Echo Glen Children's Center for juvenile offenders and a detachment and communications facilities of the Washington State Patrol.					
<u>Total at-risk critical facilities:</u> State Agency identified – 35 (owned-leased split not available)		1,076	\$30,313,286	\$31,427,862	
<u>Function of at-risk critical facilities:</u> Included in the state facilities potentially at risk to wildland fire are the campus of Echo Glen Children's Center for juvenile offenders and a detachment and communications facilities of the Washington State Patrol.					

Region 6 Profile

¹ Unless otherwise noted, information in the narrative is from *King County Profile*, Washington Department of Employment Security, Labor Market and Economic Analysis Branch, March 2001.

² *Profile of Selected Economic Characteristics: Census 2000*, U.S. Census Bureau.

³ *Traffic Statistics Rider Segment Report, January 1, 2002 through December 31, 2002*, Washington State Ferries.

⁴ *Summary of Public Transportation 2001*, Washington State Department of Transportation, November 2002 (Revised April 2003).